

Enabling Virtualization

Data Center Optimization with VMware and QLogic



Greater Virtual Machine Density, Availability, and Simplified Management for Data Center and Cloud Environments

BENEFITS OF A JOINT QLOGIC AND VMWARE SOLUTION

- Enable high-density virtual machine (VM) deployments with QLogic I/OFlex™, VMflex®, FlexOffload®, and ConvergeFlex®
- Provide for high availability in virtualized environments with virtual switching, VMflex, and QLogic N_Port ID virtualization technology
- Flexible, application-specific network resource management with QLogic VMflex and NIC Partitioning (NPAR) technologies
- Efficient adapter management via QLogic's VMware vCenter plug-in
- Proven interoperability through standards-based integration and long-standing partnerships inclusive of joint certification testing

EXECUTIVE SUMMARY

The adoption of server virtualization technology in the data center has led to an initial wave of tangible benefits by reducing the amount of physical resources that are required in a deployment. The raw number of servers needed, the amount of power to run them, and the amount of rack space required are decreased when server infrastructure is virtualized. A second wave of benefits, resulting in logical improvements in the responsiveness, flexibility, and agility of IT as a service-oriented operation, are also achievable. The improved IT capabilities, which are based on the creation of a highly available, adaptive compute environment that scales to support elastic demands on IT resources, depend on extending virtualization services throughout the network and storage components of the network infrastructure.

The VMware® vSphere® virtualization platform continues to be the dominant enterprise-class server virtualization product on the market. Integrating the VMware vSphere virtualization platform with QLogic® 10GbE Intelligent Ethernet Adapter, Converged Network Adapter, or Fibre Channel Adapter solutions for network and storage can further optimize the virtualized data center infrastructure to provide enterprise-class LAN and SAN connectivity for servers today and the cloud-enabled data center of tomorrow.

SUCCESSFUL SERVER VIRTUALIZATION DEPLOYMENT

Three of the key areas for a successful server virtualization deployment include the following: ensuring adequate I/O resources for high-density VM environments, implementing network policies on the virtualized infrastructure as required for high availability solutions, and providing tunable network resources to meet Service Level Agreement requirements for individual applications. VMware and QLogic have introduced new, virtualization-aware capabilities to address each of these user needs, helping you achieve the benefits of a fully virtualized data center.

HIGH-DENSITY VIRTUAL MACHINE ENVIRONMENTS

Challenge: Data center server I/O requirements are being driven by multi-core, multi-thread CPUs and the large number of VMs they can support. As physical servers host more and more VMs, the demand for I/O can overrun the capabilities of the traditional I/O infrastructure. Adding more I/O adapters, especially in blade server environments where PCIe® slots are at a premium, can cause scaling limitations and exacerbate power, spacing, and cooling issues.

Solutions: QLogic 10Gb Intelligent Ethernet Adapters and Converged Network Adapters provide an ideal solution for consolidation at the I/O device level in high-density VM environments, replacing multiple 1GbE adapters for better performance, reducing power, space, and cooling requirements and freeing up valuable PCIe slots on the server. In addition, QLogic FlexSuite Adapters are equipped with I/OFlex technology, which allows end users to use the same hardware for both 16Gb Fibre Channel or 10GbE server connectivity.

VMware's NetQueue technology enables dedicated transmit/receive queues and interrupt management per VM. QLogic's VMflex technology integrates with NetQueue to break through I/O bottlenecks and boost VM performance.

QLogic's adapters also offer ConvergeFlex and FlexOffload. ConvergeFlex enables concurrent support for TCP/IP, FCoE, and iSCSI protocols on one Converged Network Adapter, while FlexOffload provides the ability to offload the protocol processing tasks for FCoE, iSCSI, and TCP/IP traffic forwarding from the server's CPU to the adapter hardware. FlexOffload enables QLogic adapters to offer industry-leading CPU efficiency and application performance. In addition, it protects your server's ability to allocate CPU processing bandwidth to where it counts—your mission-critical applications.

HIGH AVAILABILITY SOLUTIONS

Challenge: VMware's vMotion™ and Storage vMotion enable VMs and their attached storage to be migrated between physical servers with continuous service availability, transaction integrity, and zero downtime. To enable this migration, the virtualized environment must be extended from the server across the network and storage components of the data center.

Specifically, vMotion depends on the destination server having access to the same LAN and SAN configuration in which the source server is currently operating. Server virtualization complicates this process by decoupling software from hardware on the server, disrupting the mapping that is the basis for assigning network and storage policies, such as VLANs in the LAN environment and Node Port IDs for SANs.

Solutions: Virtual switching within the hypervisor has been introduced to address this issue on the LAN infrastructure. It enables the network administrator to reestablish the mapping between individual VMs and the corresponding network infrastructure to support solutions that provide high availability, such as vMotion.

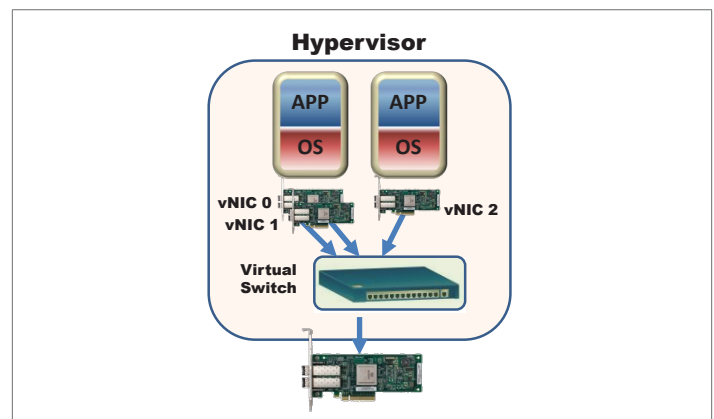


Figure 1. VMware vSphere with Virtual Switching Capability

VMware's virtual switch solution operates within the hypervisor and emulates a traditional physical Ethernet network switch, forwarding frames at the data link layer and connecting each VM with the network. VMware vSphere may contain multiple virtual switches or a vNetwork Distributed Switch (vDS), which provides a centralized point of control for cluster level networking and moves beyond the host network configuration in virtual environments.

QLogic's VMflex solution integrates the physical adapter with the virtual switch to restore visibility for the LAN network to identify and manage the virtualized servers. While VMflex includes support for VMware's virtual switches and the Cisco Nexus™ 1000v, it is Ethernet switch agnostic. The adapters are also capable of supporting HP Virtual Connect Flex-10 as well as emerging, industry-standard Edge Virtual Bridging solutions, such as Virtual Ethernet Port Aggregation (VEPA) and Bridge Port Extension (BPE). No matter the network access layer virtualization solution you implement, with VMflex there is a QLogic adapter solution that works with it.

On SAN infrastructure, N_Port ID virtualization (NPIV) enables each physical Host Bus Adapter to register multiple virtual world wide port names (vWWPNs) with the Fibre Channel switch fabric. This registration process addresses the mapping disruption introduced by virtualization of the server infrastructure, enabling end-to-end virtualization over the servers and storage network. QLogic's Fibre Channel and FCoE adapters support NPIV, allowing administrators to associate and isolate LUNs to specific VMs. This enables each VM to have access to its SAN resources irrespective of its placement on a specific physical server and facilitates seamless vMotion.

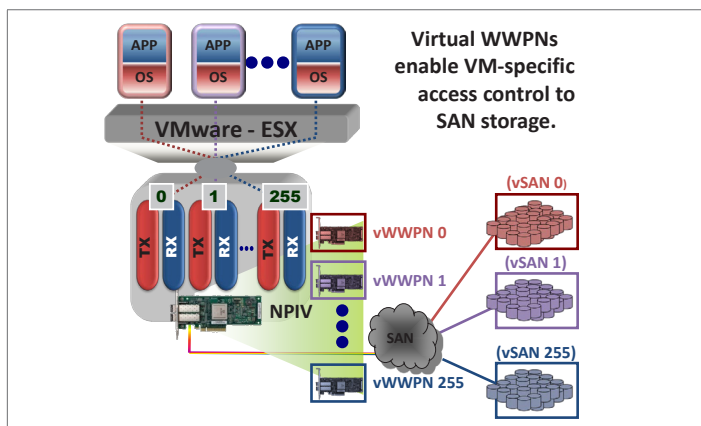


Figure 2. NPIV Enables Storage Virtualization

APPLICATION-SPECIFIC NETWORK RESOURCE MANAGEMENT

Challenge: In the traditional data center server implementation, one of the advantages of using multiple 1GbE adapters is that their I/O resources may be dedicated specifically to individual applications, such as VM mobility, hypervisor management, or storage traffic, along with all the various applications running in the VMs that are being serviced. When consolidation is done using traditional 10GbE adapters, you may lose the visibility required to dedicate resources to the individual applications, because generic 10GbE adapters do not have the ability to carve out resources and dedicate them to specific applications.

Solutions: The VMflex architecture includes QLogic's NIC Partitioning (NPAR) solution that enables a seamless migration from multiple 1Gb Ethernet adapters to a consolidated 10Gb Ethernet infrastructure by exporting a number of independent virtual interfaces, each of which can dedicate a share of the adapter hardware resources to a specific VM. Individual capacities for bandwidth and QoS treatment may be specified, as detailed in the sidebar.

In addition, QLogic delivers adapter management via QLogic's vCenter plug-in that integrates into the VMware vCenter environment:

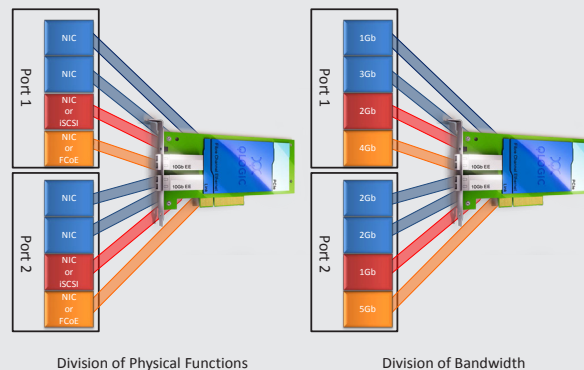
- vCenter Plug-in (available for download from the [QLogic Web site](#))
 - QLogic 2400/2500/2600 Series Fibre Channel Adapters
 - QLogic 8100/8200 Series Converged Network Adapters for TCP/IP and FCoE only
 - QLogic 3200 Series Intelligent Ethernet Adapters
- IMA Plug-in that hooks into the VMware vSphere Client application (included in the inbox/IOVP ESX®/ESXi driver)
 - QLogic 4000 Series 1GbE iSCSI Adapters
 - QLogic 8200 Series Converged Network Adapters for 10GbE iSCSI only

QLOGIC'S NPAR TECHNOLOGY

Network Interface Virtual Partitions

NPAR technology offers flexible bandwidth provisioning of four partitions per port, each sharing a 10GbE connection with the added ability to run multiple protocol functions (NIC, FCoE, and iSCSI) simultaneously. NPAR helps consolidation efforts by enabling administrators to split up the total 10Gb bandwidth as small as 100Mb increments to each partition and reallocate bandwidth and resources as needed.

NPAR gives IT organizations the enhanced flexibility to support multiple protocols and extends capacity, further reducing network cost.



SUMMARY

To deliver true virtualization benefits, end-to-end visibility must extend across server, network, and storage domains. QLogic adapters with holistic virtualization features enable true end-to-end virtualization that can be enforced and supported across the entire virtualized server, network, and storage infrastructure, extending the ability to apply networking and storage best practices in a truly virtualized data center.

ABOUT CAVIUM

Cavium, Inc. (NASDAQ: CAVM), offers a broad portfolio of infrastructure solutions for compute, security, storage, switching, connectivity and baseband processing. Cavium's highly integrated multi-core SoC products deliver software compatible solutions across low to high performance points enabling secure and intelligent functionality in Enterprise, Data Center and Service Provider Equipment. Cavium processors and solutions are supported by an extensive ecosystem of operating systems, tools, application stacks, hardware reference designs and other products. Cavium is headquartered in San Jose, CA with design centers in California, Massachusetts, India, Israel, China and Taiwan.



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